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ABSTRACT

Research in the United States and abroad has led to advances in rehabilitation technology that enables blind and visually impaired persons to compete with sighted persons for employment. Relatively inexpensive devices such as pocket calculators, transistor radios, cassette recorders, and digital watches have become aids for the blind; some calculators and watches can "talk" to the blind person. Two categories of electronic devices are described: five travel aids (Pathsounder, Laser Cane, Mowat Sensor, Sonicguide, and Night Vision Scope) and four information/reading aids (Versa Braille, Kurzweil Reading Machine, View Scan, and Optacon). Drawbacks include the largely prohibitive cost of these devices for the majority of consumers, and the fact that professional training in their use is initially required. Contact sources for further information are provided. (JW)

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Rehabilitation Technology for the Blind in the United States

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Rehabilitation Technology for the Blind in the U.S.

Recent developments in rehabilitation technology for the blind are now being utilized to help visually impaired persons obtain or keep jobs. Many of these developments have been outgrowths of research done in other countries but field tested in the United States. Other developments have occurred from research conducted directly in the United States.

Many research endeavors in the U.S. have resulted in making available to the blind and visually impaired inexpensive pocket calculators, transister radios, cassette recorders, and digital watches. In addition, calculators and watches can now "talk" to the blind person, as well as machines and computers that use synthesized speech outputs. As a result, blind and visually impaired persons, with the proper training, can compete with sighted persons for jobs previously limited only to the latter; as Mellor (1981) noted: 1) A blind office manager can perform mathematical operations with a calculator that uses synthetic speech to tell him what numbers he has entered and what the answers are; 2) By using special lenses, a visually impaired teacher can watch her children play and lead them out of the school building during fire drills; 3) Both blind and low vision persons can use electronic devices to read using the same materials as those prepared for sighted persons; and 4) By means of calculators with speech, braille, or audible outputs, visually impaired scientists can readily obtain the results of intricate computations. (p.1)

Although sensory aids for the blind have enabled these persons to compete in a sighted world, they are no replacement for the loss of vision. A sensory aid transforms information that would normally be presented through the sense of vision, in this case, into a form that can be conveyed through a sensory modality that is still intact or usable (Mellor, 1981). There are electronic aids that magnify a written image, that enhance the field of view, and that bring the environment within the grasp or hearing of the visually impaired traveler.

Many of the devices now available to the visually impaired have been the result of indirect research rather than deliberate planning. For instance, the International Telephone and Telegraph (ITT) Company's Passive Night Vision scope was originally developed for the U.S. Army to use during the Vietnam conflict. Today it is used by many night blind persons to travel in dimly lighted or night-time conditions. The Sonic-guide, or binaural, ultrasonic spectacles are an outgrowth of research conducted by Leslie Kay for the Royal British Navy. While investigating underwater sonar systems to detect submarines, Kay realized that devices using ultrasonics might also be useful for blind persons.

Electronic aids for the blind can be divided into travel aids and information/reading aids. Travel aids send out electrical impulses in the form of ultrasounds or laser beams, which reflect off of an object and return to the aids. These impulses are then translated into audible and/or tactual information that need to then be processed by the blind traveler. Reading and information aids translate what they "see" into simlarly shaped objects or a voice translator/synthesizer.

Research into these devices in the U.S. has been in large part supported by the federal government in the forms of stipends, grants,

and research and development funds. Although the Sonicguide, for example, was developed by Kay, a New Zealander, the majority of research and training was funded by grants from the U.S. Veterans Administration. The Kurzweil Reading Machine received much of its funding from the Bureau of Education for the Handicapped within the U.S. Office of Education.

Presently the following devices are readily available in the U.S. and worldwide. Unfortunately, their costs are still prohibitive to the majority of consumers. Many of the aids, especially the travel aids, require the blind consumer to be professionally trained with the device by a certified orientation and mobility instructor, thus further limiting their availability and acceptance.

Travel Aids

1) Pathsounder - the Lindsey Russell Pathsounder is a box-like device that hangs in front of the user's chest by a neck strap. The device sends out a beam of ultrasound ahead of the user which will be reflected back upon contact with an object. The ultrasounds are electrically converted into an audible, low-pitched buzz if the object is between 3-6 feet away and a higher pitched tone if the object is within 3 feet. Additionally, the box will vibrate if the object is between 3-6 feet away, and the next strap will vibrate if the object is within 3 feet; a useful component for deaf-blind persons. The Pathsounder should be used with a long, white cane, but can be adapted to be used by wheelchair or crutch users.

2) Laser Cane - the Nurion Laser Cane looks similar to the familiar long, white cane, but houses a computerized laser beam system. Three

beams are emitted that, when reflected back to the cane after contact with an object, are translated into three separate and distinct tones that tell the user if the object is in front of, at head height, or below the travel surface level. Thus, a blind traveler can be forewarned of an overhanging tree limb, a pedestrian, or an upcoming street curb from 3-12 feet prior to contact.

3) Mowat Sensor - The Mowat Sensor is a handheld device a little larger than a pack of cigarettes that emits ultrasounds which when reflected back are translated into a gentle vibration of the entire box. The device is handy for spotting landmarks and needs to be used along with a long cane or dog guide.

4) Sonicguide - The Wormald Sonicguide is an ultrasonic, binaural pair of spectacles that tell the user how far away an object is up to 15 feet (by the pitch), where is is azimuthally (binaurally), and what it is composed of (tonal characteristics). This last piece of information makes this device a true environmental sensor. A blind traveler can walk along a sidewalk and determine the exact location of pedestrians, trees, fire hydrants, and mail boxes, etc., and can identify and distinguish among them. The Sonicguide must be used as a complement to the long cane or dog guide.

5) Night Vision Scope - The I.T.T. Night Vision scope can detect existing nonvisual light and magnify it to be seen by the eye, or it can create its own infrared light and then magnify it to be seen by the user. As it works on the same principle as television systems, it need not be focused and, thus, can be used while walking. Presently, it is designated to be used monocularly, with or without an accompanying travel aid.

Reading Aids

1) Versa Braille - translates printed material into braille either on magnetic tape or hard readout; can be attached to a printer or a computer (30K memory). Accompanied by wordprocessing software.

2) Kurzweil Reading Machine (KRM) - converts print directly into synthesized speech when the user places the text, letter, memo, etc., directly onto a glass surface. A high resolution camera scans the line of print, the image is processed by a computer, identified, and a speech synthesizer is activated to speak the words.

3) View Scan - a portable print enhancer/magnifier for low vision persons. A camera scans the line of print, the device processes and translates the information onto photocells. Can be attached to a computer.

4) Optacon - an optical to tactile converter. A small camera scans the line of print and the images are converted to tactile impressions onto the user's finger tip in the same shape and form.

The applications of these devices are too numerous to mention here. However, it must be noted that these devices have enabled blind persons to travel into previously restricted (or highly dangerous) environments, and to obtain or keep jobs not hitherto available to them. For further information on these and other technological aids for the blind, interested persons should contact:

1. American Foundation for the Blind (various other devices)
   15 West 16th Street
   New York, New York, U.S.A. 10011

2. Nurion (Laser Cane, Pathsounder)
   651 Allandale Rd.
   King of Prussia, Pennsylvania, U.S.A. 19406

3. Sensory Aids Corporation (Mowat Sensor, Sonicguide)
   205 West Grant Avenue, Suite 110
   Bensenville, Illinois, U.S.A. 60106

4. Telesensory Systems, Inc. (View Scan, Versa Braille, Optacon)
   P.O. Box 7455
   Mt. View, California, U.S.A. 94039-7455

5. The Xerox Corporation (Kurzweil Reading Machine)
   Stamford, Connecticut, U.S.A. 06904

References:

Mellor, C.M. Aids for the 80's: What They Are and What They Do. New York: American Foundation for the Blind, 1981.